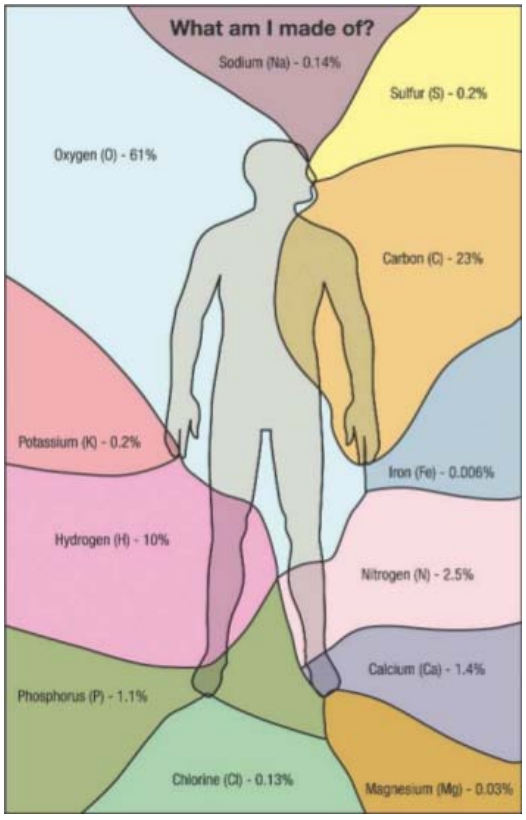

Unit 2 Biochemistry

Term 3 **11-12**

Nutrition Facts
Valeur nutritive
Per 1 large egg (53 g) /
pour 1 oeuf gros (53 g)

Amount / Teneur	% Daily Value / % valeur quotidienne
Calories / Calories 70	
Fat / Lipides 5 g	**8** %
Saturated / Saturés 1.5 g	**8** %
+ Trans / Trans 0 g	
Cholesterol / Cholestérol 195 mg	
Sodium / Sodium 65 mg	**3** %
Carbohydrate / Glucides 1 g	**1** %
Fibre / Fibres 0 g	**0** %
Sugars / Sucres 0 g	**0** %
Protein / Protéines 6 g	
Vitamin A / Vitamine A	**10** %
Vitamin C / Vitamine C	**0** %
Calcium / Calcium	**2** %
Iron / Fer	**6** %
Vitamin E / Vitamine A	**50**%

Elements Found in the Human Body

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac															

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu

Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

Common Elements Trace Elements Remaining Elements

Unit 2: CHEMISTRY OF LIFE

Unit Must Knows	*Key Vocabulary*
1) Students will be able to explain how atoms interact. (p. 28-30) a) The atom is composed of **protons**, **electrons** and **neutrons**. b) A **covalent bond** shares electrons. c) An **ionic bond** steals electrons. d) A **hydrogen bond** is a weak bond with an unequal share of electrons. e) An **element** is a pure substance whereas a **compound** combines multiple types of elements. **2) Students will be able to describe the different properties of water.** (p. 31) a) **Cohesion** allows water to form rain drops. b) **Adhesion** allows water to stick to other surfaces. c) **Water absorbs heat** slowly but retains it longer than other substances. **3) Students will be able to describe how water dissolves substances.** (p.32-33) a) A **solution** is created when one substance is evenly distributed within another. b) The **pH scale** measures the strength of acids and bases. c) An **acid** creates more hydrogen ions when added to water. d) A **base** creates more hydroxide ions when added to water. **4) Students will be able to summarize the characteristics of organic compounds.** (p. 34-37) a) The four **organic compounds** include carbohydrates, proteins, lipids, and nucleic acids. b) **Carbohydrates** are broken down into monosaccharides, which are used as a source of energy. c) **Proteins** are broken down into amino acids, which are used for building muscles and protection against diseases. d) **Lipids** are broken down into fatty acids, which are used for building cell membranes and storage of energy. e) **Nucleic acids** are broken down into nucleotides, which are used for holding hereditary information or making proteins. **5) Students will be able to explain the importance of ATP.** (p.37-42) a) Chemical reactions **absorb or release energy**. b) **Energy is released from food** and stored in the form of ATP for cells to use. c) **Enzymes** help speed up chemical reactions. d) How **pH & temperatures** affect enzyme activity. **6) Students will be able to connect the chemistry to the living world.** (p.345-354) a) Relate the importance of the ***cycling*** of chemicals in the **Carbon Cycle**, **Nitrogen Cycle** & **Water Cycle** to the needs of living organisms. b) Relate the ***flow*** of Energy through **food webs**, **food chains** and the **food pyramid**.	• Atom • Protons • Electrons • Neutrons • Element • Compound • Molecule • Bond • Chemical Formula • Ion • Polarity • Cohesion • Adhesion • Solution • Soluble • Acid • Base • Organic Compound • Carbohydrates • Glucose • Glycogen • Starch • Monosaccharide • Disaccharide • Polysaccharide • Lipid • Protein • Polypeptide • Amino Acid • Nucleic Acid • Nucleotide • DNA • Heredity • RNA • ATP • Energy • Activation Energy • Enzyme • Substrate • Active Site

Unit 2 Biochemistry Key Terms

Atom

Protons

Electrons

Neutrons

Element

Compound

Molecule

Bond

Chemical Formula

Ion

Polarity

Cohesion

Adhesion

Solution

Soluble

Acid

Base

Organic Compound

Carbohydrates

Glucose

Glycogen

Starch

Monosaccharide

Disaccharide

Polysaccharide

Lipid

Protein

Polypeptide

Amino Acid

Nucleic Acid

Nucleotide

DNA

Heredity

RNA

ATP

Energy

Activation Energy

Enzyme

Substrate

Active Site

Bell Ringer Worksheet

Question:	**Date:**
Answer:	

Question:	**Date:**
Answer:	

Question:	**Date:**
Answer:	

Question:	**Date:**
Answer:	

Question:	**Date:**
Answer:	

Question:	**Date:**
Answer:	

Must Knows:

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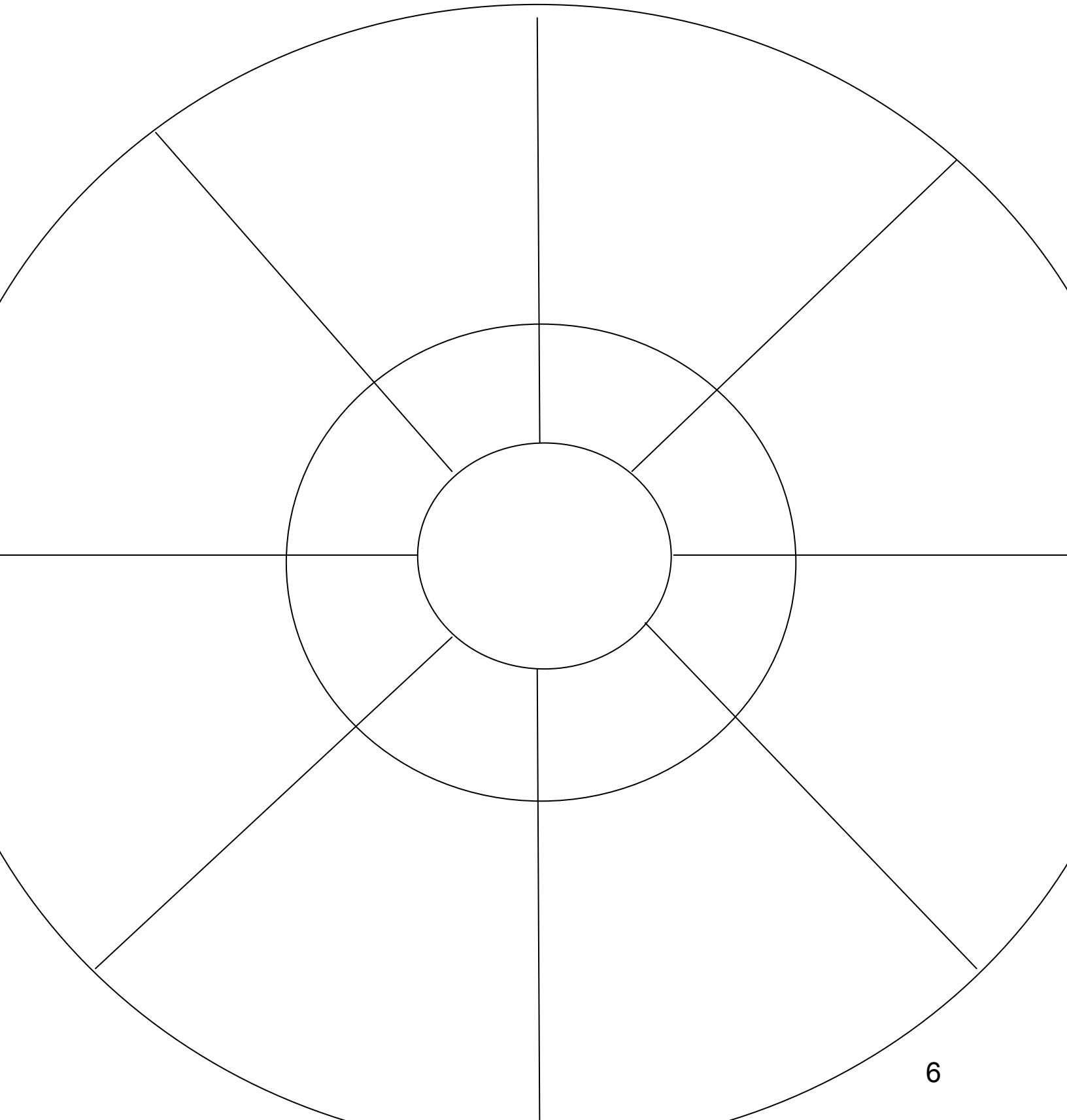

Must Knows:

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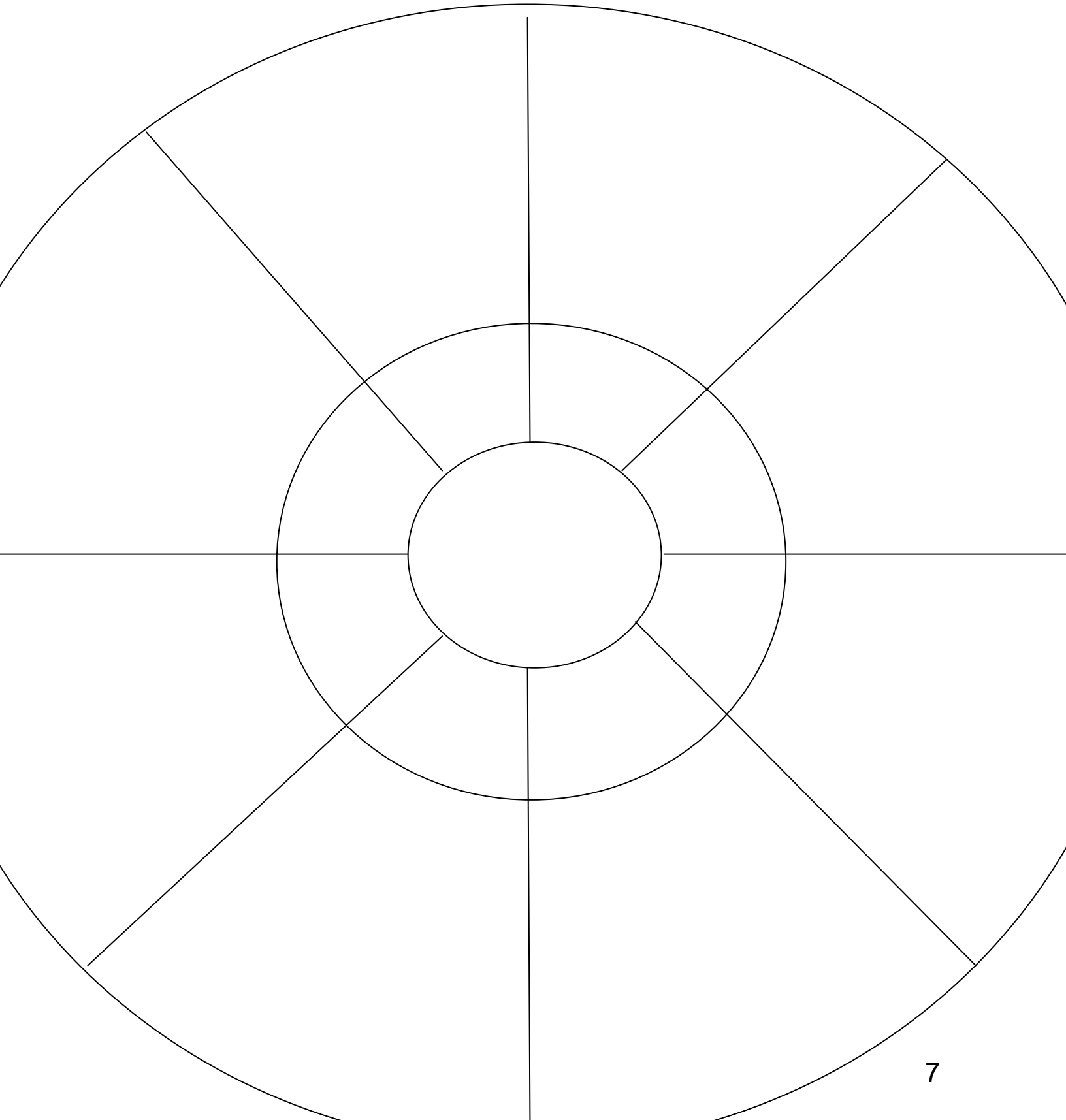

Must Knows:

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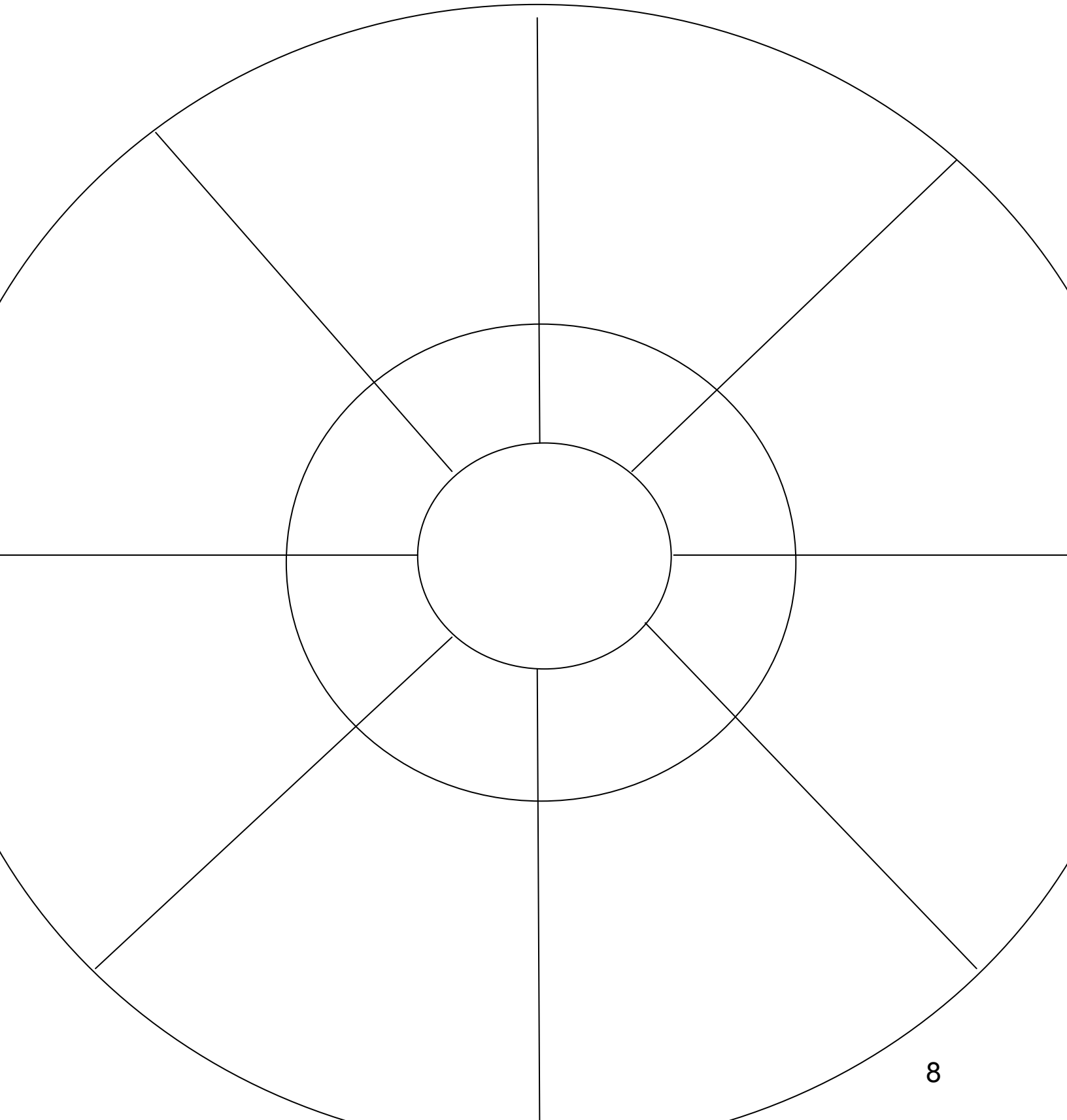

Must Knows:

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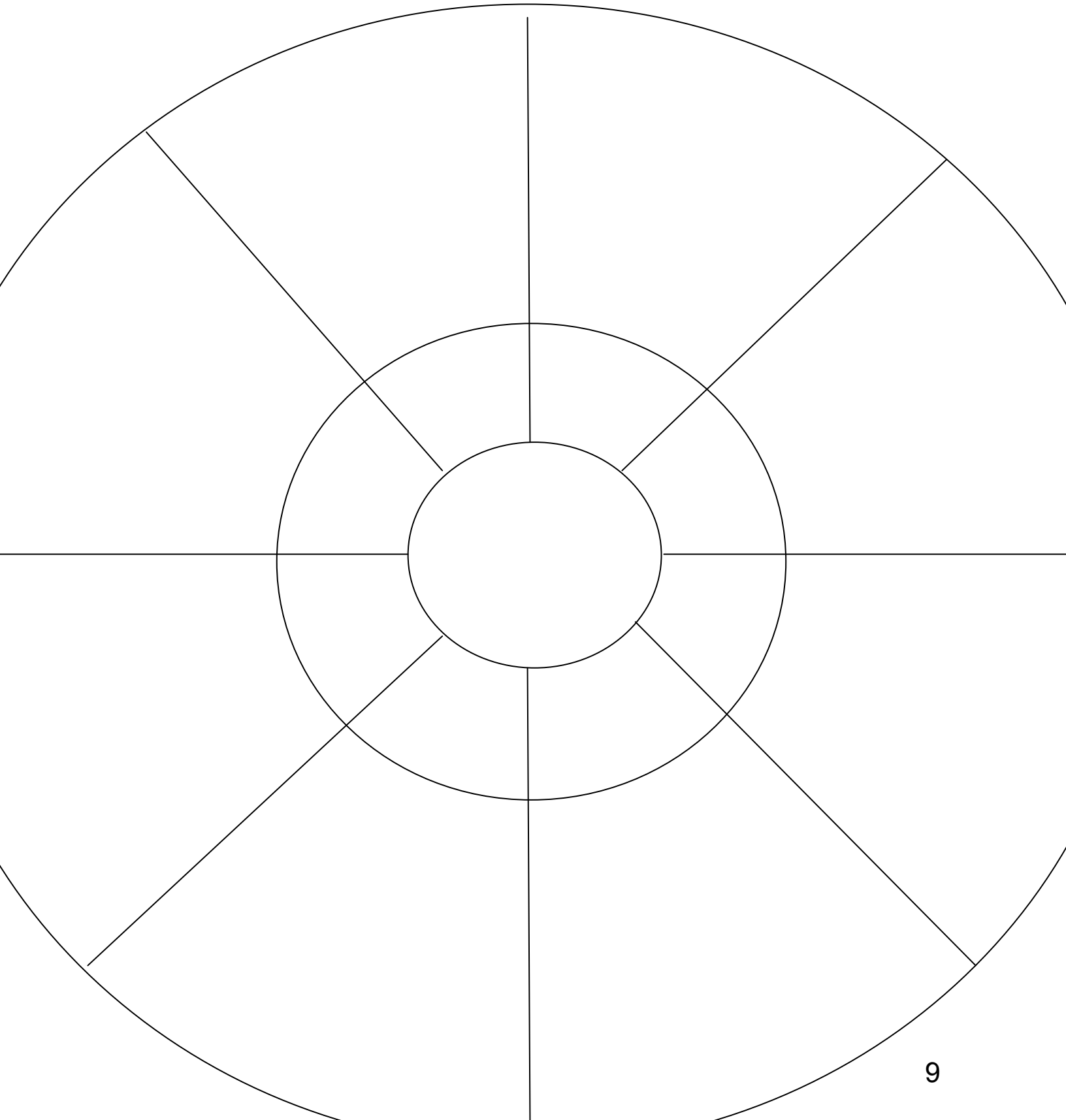

Must Knows:

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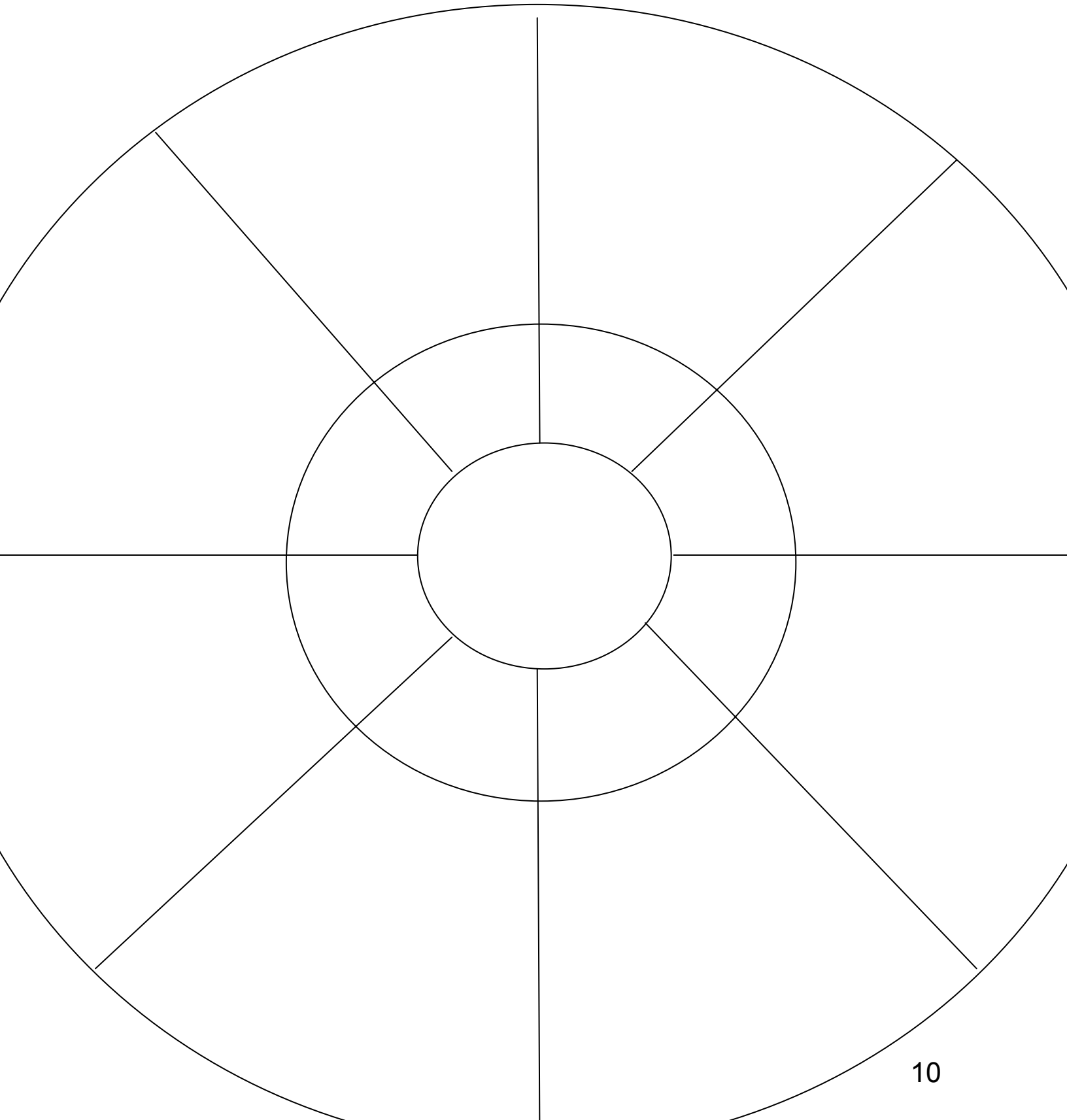

Must Knows:

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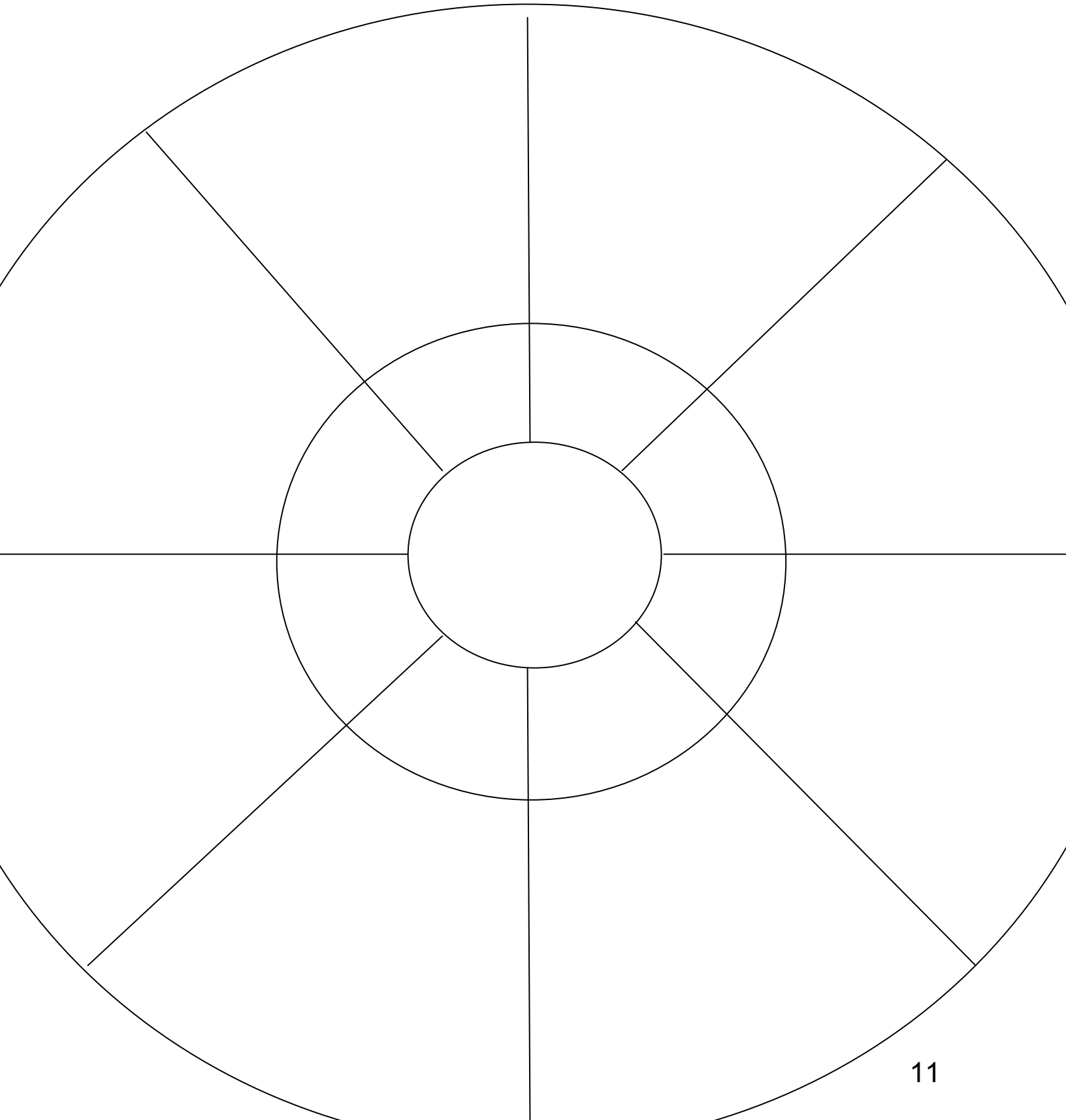
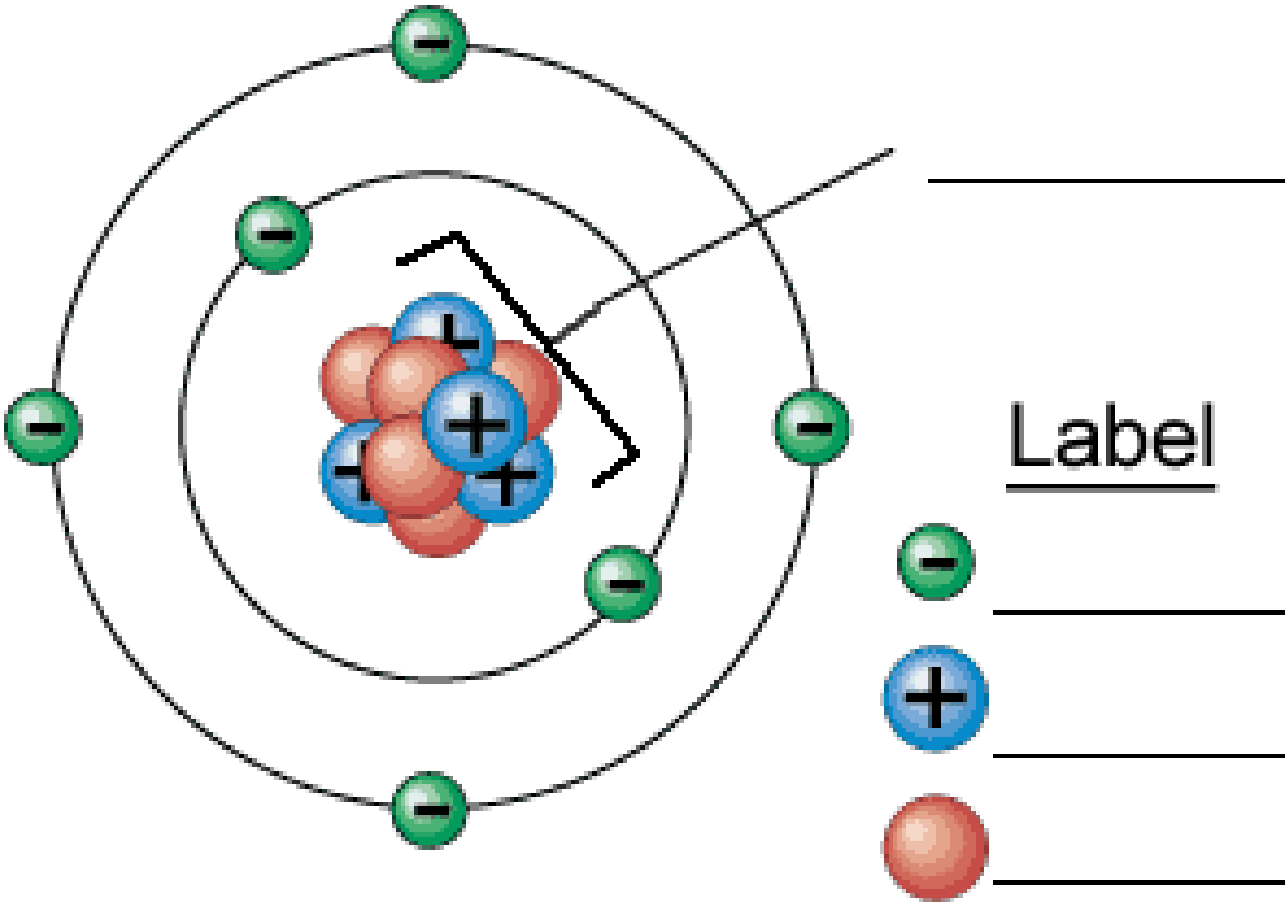
_____



Label the sub atomic particles of the atom.



CONCEPT 4.1 Life requires about 25 chemical elements. pp. 72-73

Objectives

- List the most common elements in living things.
- Compare and contrast elements and compounds.

Key Terms

- matter
- element
- trace element
- compound

Are you wondering why you're reading about chemistry in a biology textbook? The answer is that all of biology involves chemistry. All living things share the same chemical building blocks and depend on chemical processes for survival.

Elements

Humans and other organisms and everything around them are examples of matter. Matter is anything that occupies space and has mass—the physical "stuff" of the universe. Rock, wood, air, metal, water, and animals are all matter.

The various forms of matter are composed of one or more chemical elements. An element is a pure substance that cannot be broken down into other substances by chemical means. Examples of naturally occurring elements include some you have probably heard of, such as gold, helium, mercury, and oxygen. Elements are often described as the "basic ingredients" of matter because the more complex forms of matter (including you) are made from elements.

About 25 elements are essential to life (Figure 4-1). Four of these elements—oxygen (O), carbon (C), hydrogen (H), and nitrogen (N)—make up about 96 percent of the living matter in your body. Calcium (Ca), phosphorus (P), potassium (K), sulfur (S), and a few other elements account for most of the remaining 4 percent. Trace elements, elements that make up less than 0.01 percent of your body mass, are nevertheless critical to your health. For example, you need about 0.15 milligram (mg) of the trace element iodine each day. If you don't get enough iodine, your thyroid gland (a gland in your throat that regulates certain chemical processes in your body) does not function properly. Another trace element, iron, makes up only about 0.004 percent of your body mass, but it is essential for carrying oxygen in your blood. Examples of other trace elements include copper, fluorine, manganese, and selenium. A balanced diet will usually provide you with the trace elements you need.

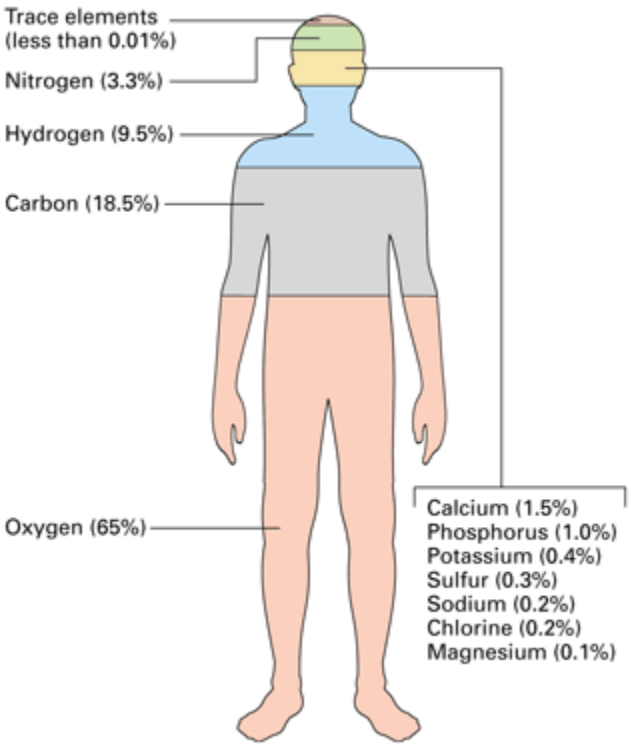


Figure 4-1
This chart compares percentages of various elements in your body. All of the elements represented are essential to life.

Compounds

Most elements can interact with other elements, forming more complex types of matter called compounds. A compound is a substance containing two or more elements that are chemically combined in a fixed ratio. For example, water (H_2O) is a compound that always contains the same ratio of hydrogen combined with oxygen.

A compound's properties may differ greatly from those of its component elements. The white crystals of table salt, or sodium chloride (NaCl), on a pretzel look very different from the silvery gray sodium metal and yellowish-green chlorine gas. Similarly, while water is a liquid at room temperature, both oxygen and hydrogen in their elemental form are gases.

Though simple compounds like sodium chloride and water play important roles in living things, most compounds found in organisms are more complex, containing at least three or four elements. For example, the sugars in flower nectar and in maple tree sap are composed of carbon, hydrogen, and oxygen. The compounds in the muscles that wag a dog's tail or blink your eyes consist mostly of carbon, hydrogen, oxygen, and nitrogen.

Concept Check 4.1

1. List the four most abundant elements in your body, in order of decreasing percent of body mass.

2. How are elements and compounds different?

3. Give an example showing the importance of trace elements to the human body.

Name _____ Class _____ Date _____

Skills Worksheet

Water and Enzymes

ANALYZING INFORMATION/INTERPRETING GRAPHICS

Dirt sticks to the body either by becoming trapped in microscopic wrinkles in the skin or, if the dirt is moist, by adhering to the body. Sometimes the natural oils on skin will give the dirt an oily coating. In such cases, water alone will not remove the dirt, but soap and water will. Use the information below and your understanding of polarity and chemical bonding to answer questions 1–3.

A. A soap molecule is long with one end attracted to oil molecules.

B. One end of a soap molecule is polar, and the other end is nonpolar.

C. Soap will dissolve, and the soap molecules will float freely in water.

D. A sewing needle will rest upon the surface of water. If powdered laundry detergent is gently sprinkled near the needle, the needle will eventually sink.

Read each question, and write your answer in the space provided.

1. Explain why adding soap to water will help remove dirt and oil.

2. Why does the needle float on the water?

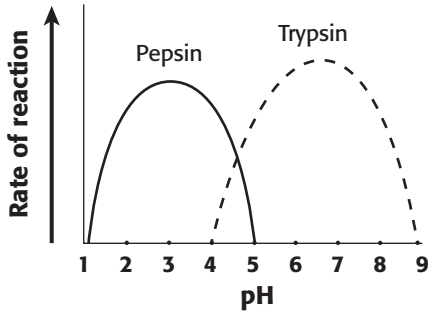
3. Why does the needle sink after soap is added to the water?

Name _____ Class _____ Date _____

Water and Enzymes *continued*

The graph below shows the rate of enzyme activity in relation to pH for two enzymes—pepsin and trypsin. Both enzymes break down molecules in food taken into the human body, but the enzymes act in series. Pepsin breaks some bonds in very large molecules. Trypsin acts on the fragments produced by the action of pepsin, breaking them into even smaller units. Use the graph to answer questions 4–8 below.

Enzymes and pH



Read each question, and write your answer in the space provided.

4. The liquid in the stomach has a pH of about 2. Which of the two enzymes would be active in the stomach?

5. The liquid in the small intestine has a pH of about 8. Which of the two enzymes would be active in the small intestine?

6. What must happen to the liquid as it passes from the stomach to the small intestine for digestion to occur normally?

Name _____ Class _____ Date _____

Water and Enzymes *continued*

7. Consider the data on the relationship between pH and enzyme activity shown in the graph. Do enzymes typically function only at a specific pH, or can they function at a range of pH values?

_____

_____

_____

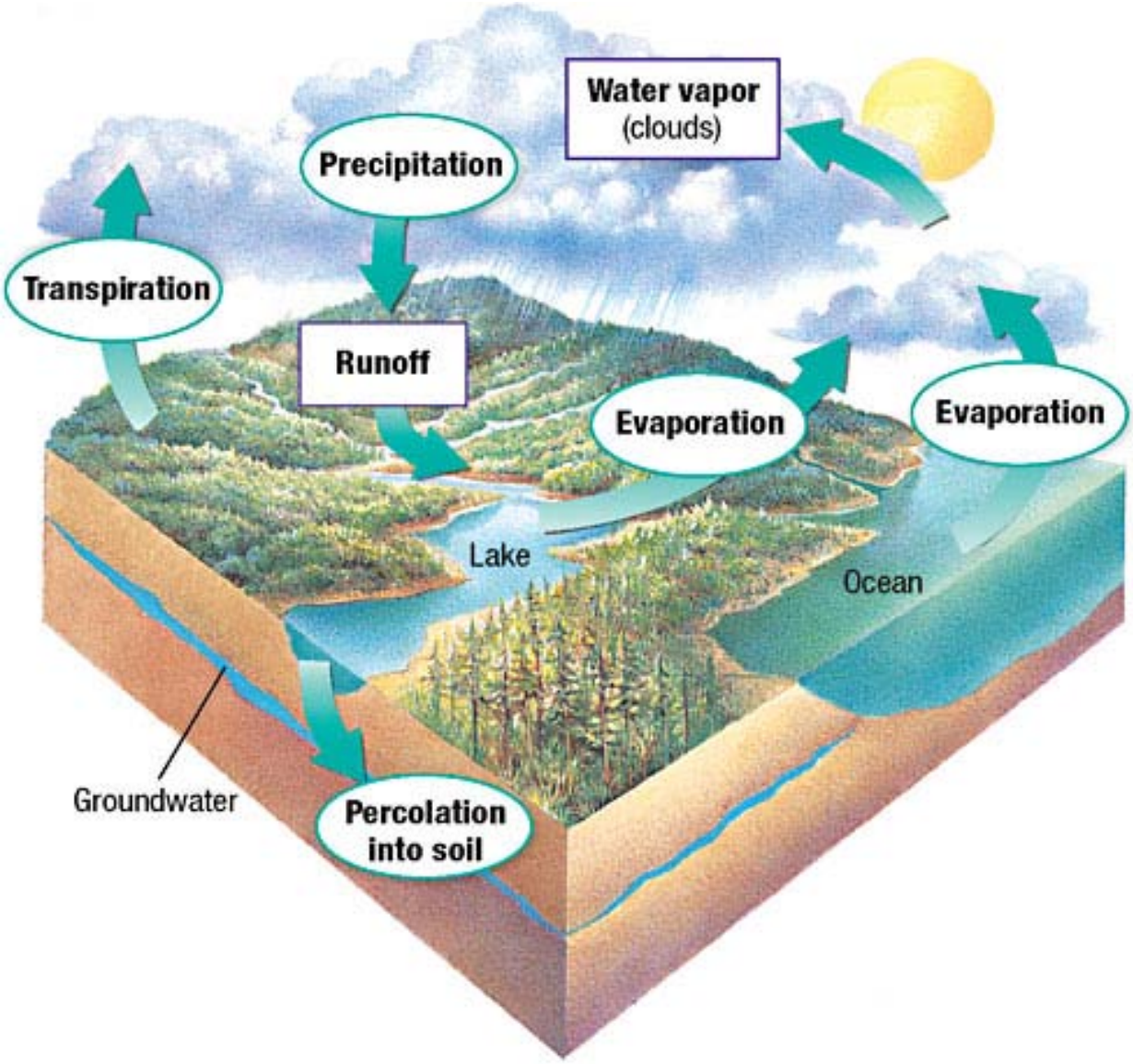
8. Can pepsin and trypsin function in the same environment? Explain.

_____

_____

_____

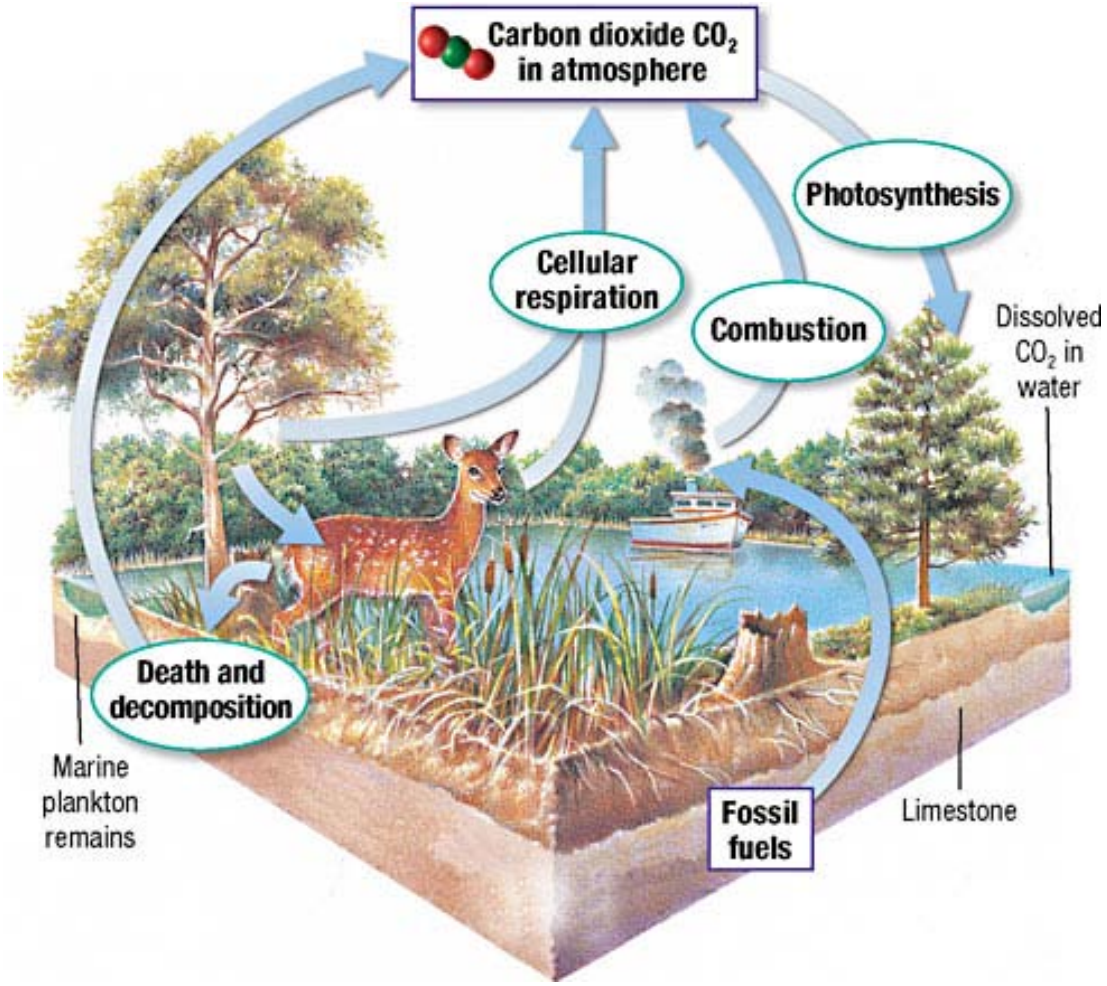
Water Cycle



Use the Water cycle diagram and the notes from Unit 2 to answer the following questions.

1. Evaporation is the process where a liquid changes from its _____ state to a _____ state.
2. Why is evaporated water so clean?
3. Condensation occurs when a _____ is changed into a _____.
4. Condensation is the opposite of _____.
5. When the _____ and _____ are right, the small droplets of water in clouds form larger droplets and precipitation occurs.

6. Using the terms "evaporation", "condensation", and "precipitation", explain the water cycle in your own words.
7. What factor is most important in determining whether water is a solid, liquid, or gas?
8. Is the amount of water on Earth always changing or is it a constant amount?



Use the diagram and the notes from unit 2 to answer the following questions:

1. **What inorganic molecule is carbon normally found in?**
2. **Name an organic molecule that carbon is found in.**
3. **What molecule do trees get their carbon from?**
4. **Where do primary consumers get their carbon from?**
5. **What process adds carbon to the atmosphere?**
6. **What process removes carbon from the atmosphere?**
7. **How does oxygen get into the water?**
8. **What do producers produce?**

9. **List 3 groups of producers?**

10. **What group eats producers?**

11. **How does carbon get back into the atmosphere from the food we eat?**

12. **Where do secondary consumers get their carbon from?**

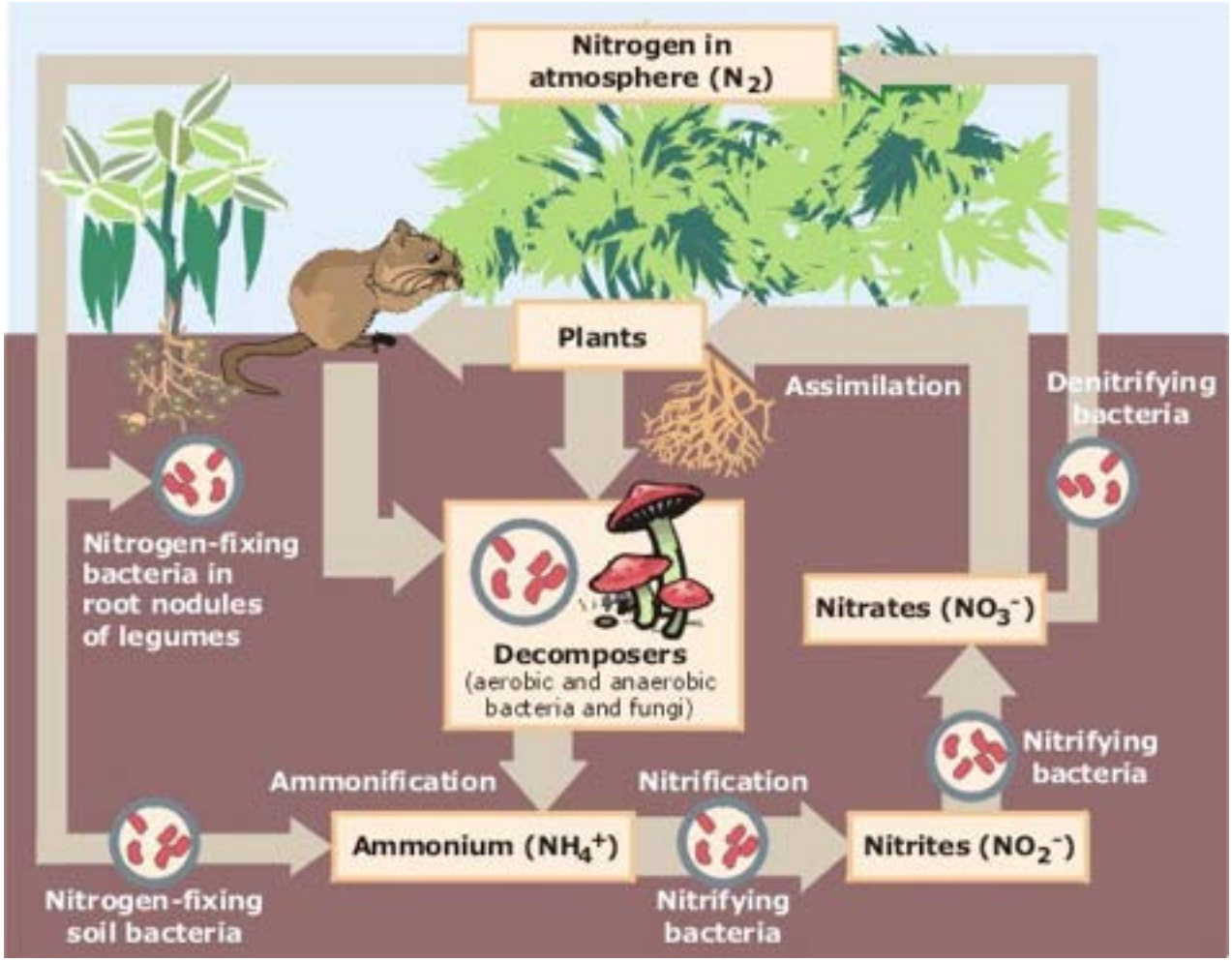
13. **Where does an animal's or plant's carbon go when it dies?**

14. **Why should the amount of carbon in the atmosphere stay the same?**

15. **How is extra carbon getting into the atmosphere today?**

16. **List 3 ways that we could reduce the extra carbon that is getting into the atmosphere.**

Nitrogen Cycle



Using the diagram above and the notes from Unit 2 answer the following questions.

1. **Why do plants and animals and animals need nitrogen (N)?**

2. **What molecule in the atmosphere is nitrogen normally found in?**

3. **What molecule in the ground is nitrogen found when there is <u>no</u> oxygen around?**

4. **What molecule in the ground is nitrogen found when there <u>is</u> oxygen around?**

5. **What organic molecule is nitrogen found in?**

6. **What are 2 ways that atmospheric nitrogen gets into the ground?**
7. **What organisms (living things) do the nitrogen fixation for plants?**
8. **Why don't farmers have to put nitrogen fertilizer on soybeans?**
9. **Where do plants get their nitrogen from?**
10. **How do primary consumers get their nitrogen from?**
11. **How do secondary consumers get their nitrogen from?**
12. **What's another term for a primary consumer?**
13. **What's another term for a secondary consumer?**
14. **Where does an animal's or plant's nitrogen go when it dies?**
15. **Who breaks the dead organisms' body back into inorganic nitrogen?**

Section: Nature of Matter

Complete each statement by writing the correct term or phrase in the space provided.

1. A(n) _____ is the smallest unit of matter that cannot be broken down by chemical means.
2. A(n) _____ is a substance made of only one kind of atom.
3. A(n) _____ _____ is a weak chemical attraction between polar molecules.
4. A completely filled outer electron level makes an atom _____.
5. Atoms gain or lose _____ to form ions.
6. Water is an example of a(n) _____ compound.
7. Polar molecules have a(n) _____ distribution of electrical charges.

In the space provided, explain how the terms in each pair differ in meaning.

8. molecule, atom

_____

_____

9. compound, element

_____

_____

Section: Water and Solutions

Complete each statement by writing the correct term or phrase in the space provided.

1. One substance that heats more slowly than many other substances is _____ .

2. When humans sweat, water releases heat through _____ .

3. An attraction between substances of the same kind is called _____, while an attraction between different substances is called _____ .

Read each question, and write your answer in the space provided.

4. Why do ionic compounds dissolve in water?

_____

_____

_____

5. What is a solution?

_____

_____

_____

6. Distinguish between acids and bases.

_____

_____

_____

Section: Chemistry of Cells

Complete each statement by writing the correct term or phrase in the space provided.

1. The carbon atoms in organic molecules are bonded to other atoms by _____ bonds.

2. The four major classes of organic compounds are _____ , _____ , _____ , and nucleic acids.

3. The building blocks of carbohydrates are _____ .

4. If a carbohydrate molecule contained six carbon atoms, it would also contain _____ hydrogen atoms.

5. Humans cannot digest the carbohydrate _____ .

6. Fats are lipids that store _____ .

Complete each statement by underlining the correct term or phrase in the brackets.

7. Lipids will dissolve in [water / oil].

8. Fats are composed of three fatty acid molecules joined to a molecule of [glycerol / protein].

9. At room temperature, [saturated / unsaturated] fats are usually liquids.

10. A protein is a chain of linked smaller molecules called [amino acids / lipids].

Read each question, and write your answer in the space provided.

11. What two factors determine the shape of a protein?

_____

_____

12. What roles do proteins play in organisms?

_____

_____

In the space provided, write the letter of the description that best matches the term or phrase.

_____**13.** nucleic acid

_____**14.** nucleotide

_____**15.** DNA

_____**16.** RNA

_____**17.** ATP

a. temporarily stores energy

b. involved in the production of proteins

c. subunit of DNA and RNA

d. one of the major classes of organic compounds

e. stores hereditary information

Section: Energy and Chemical Reactions

Read each question, and write your answer in the space provided.

1. Why is energy important to living things?

_____

_____

2. How does the energy in food become available to organisms?

_____

_____

In the space provided, write the letter of the description that best matches the term or phrase.

_____ **3.** energy

_____ **4.** reversible reaction

_____ **5.** products

_____ **6.** chemical reaction

_____ **7.** activation energy

_____ **8.** reactants

a. ending materials in a chemical reaction

b. energy needed to start a chemical reaction

c. chemical bonds between atoms are broken and new ones are formed

d. can proceed in the opposite direction

e. the ability to move or change matter

f. beginning materials in a chemical reaction

In the space provided, explain how the terms in each pair differ in meaning.

9. energy-releasing reaction, energy-absorbing reaction

_____

_____

10. reactants, products

_____

_____

Read each question, and write your answer in the space provided.

11. What is a catalyst?

_____

_____

12. What is an enzyme?

_____

_____

Complete each statement by writing the correct term or phrase in the space provided.

13. A substance on which an enzyme acts is called a(n)

_____ .

14. Hydrogen _____ is a substrate of the enzyme catalase.

15. A(n) _____ _____ is the part of the enzyme into which the substrate fits.